A nomogram for predicting local recurrence risk in breast cancer patients after intraoperative radiotherapy

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Purpose/Objective - This study aimed to develop a predictive tool for assessing the risk of local recurrence (LR) in breast cancer (BC) patients treated with intraoperative electron radiotherapy (IOERT) as the sole modality.

Methods – The analysis included patients diagnosed with primary BC who received IOERT at the European Institute of Oncology (IEO) between 2000 and 2016. The primary endpoint was the rate of LR, defined as recurrence in the same quadrant or other quadrants of the ipsilateral breast, with or without concurrent nodal involvement or distant metastasis. Statistically significant predictors of LR were identified through univariate and multivariate analyses, and a predictive nomogram was developed based on a logistic regression model. The nomogram was internally validated using the Hosmer and Lemeshow goodness-of-fit test for calibration.

Results – A total of 3,397 patients were included. Multivariate analysis revealed that younger age, tumor size ≥ 1.5 cm, grade 2-3, ER and PR-negative status, nodal involvement, histologic subtype, and molecular subtype other than Luminal A or HER2-positive receiving anti-HER2 therapy were significant predictors of LR and were incorporated into the nomogram (**Figure 1**). At a median follow-up of 6.1 years (range 4.3-8.0), there were 265 LR events (7.8%), with cumulative incidence rates of 4.4% (95% CI, 3.7-5.2) at 5 years and 13.5% (95% CI, 11.7-15.5) at 10 years. Internal validation was performed using the IOERT arm of the ELIOT phase III randomized trial (585 patients), and calibration plots showed good agreement between predicted and observed probabilities at 5 years, with less accurate prediction at 10 years, although the differences were not statistically significant (**Figure 2**).

Conclusion - The nomogram demonstrated good predictive performances in an internal validation using the ELIOT trial population, with a better risk prediction at 5 years, making it a valuable tool for guiding treatment decisions in breast cancer patients candidates to IOERT.

Figure 1. Nomogram for predicting the 5-year and 10-year probability of IBTR, according to the multivariable Fine and Gray regression model

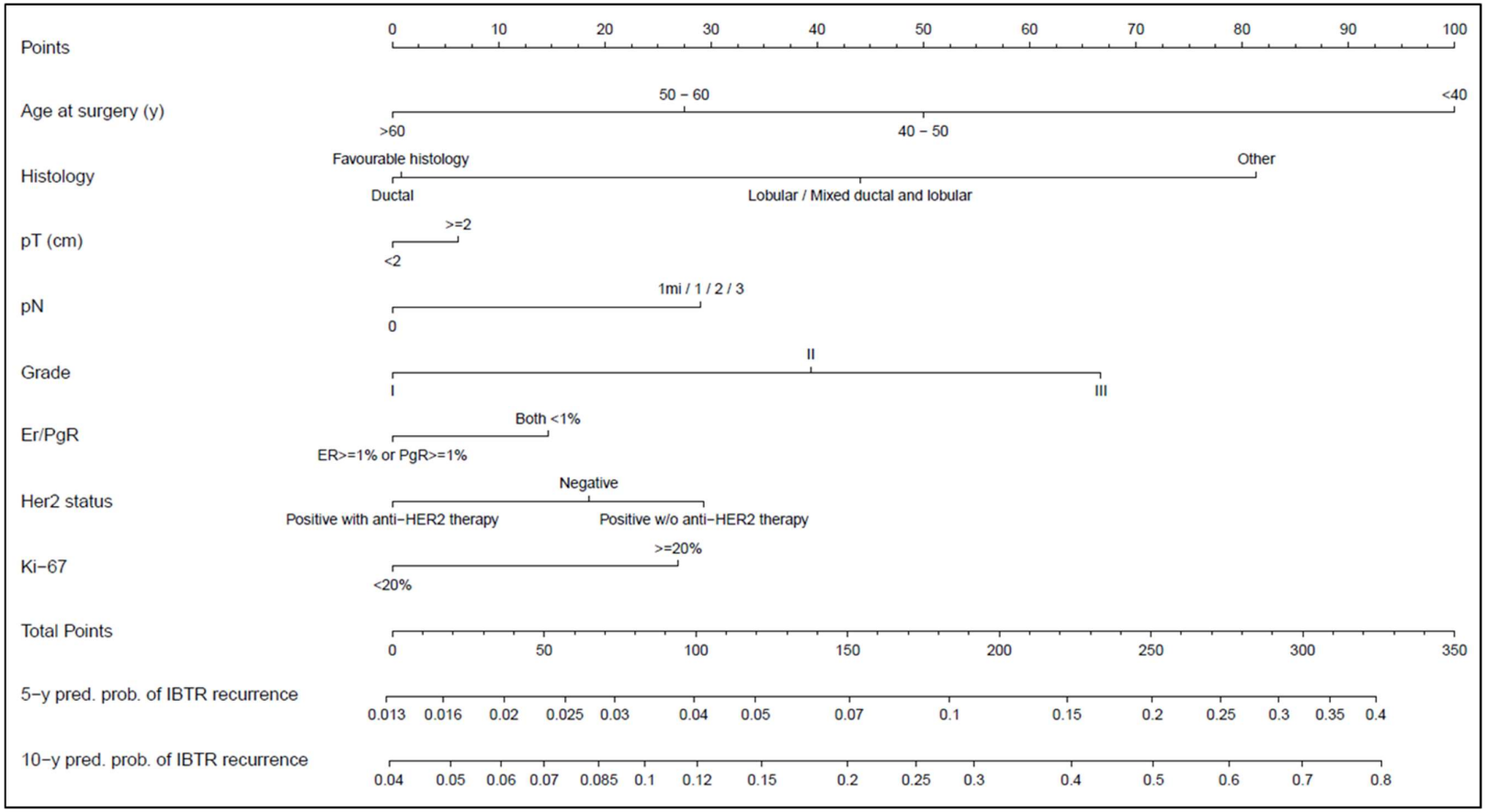
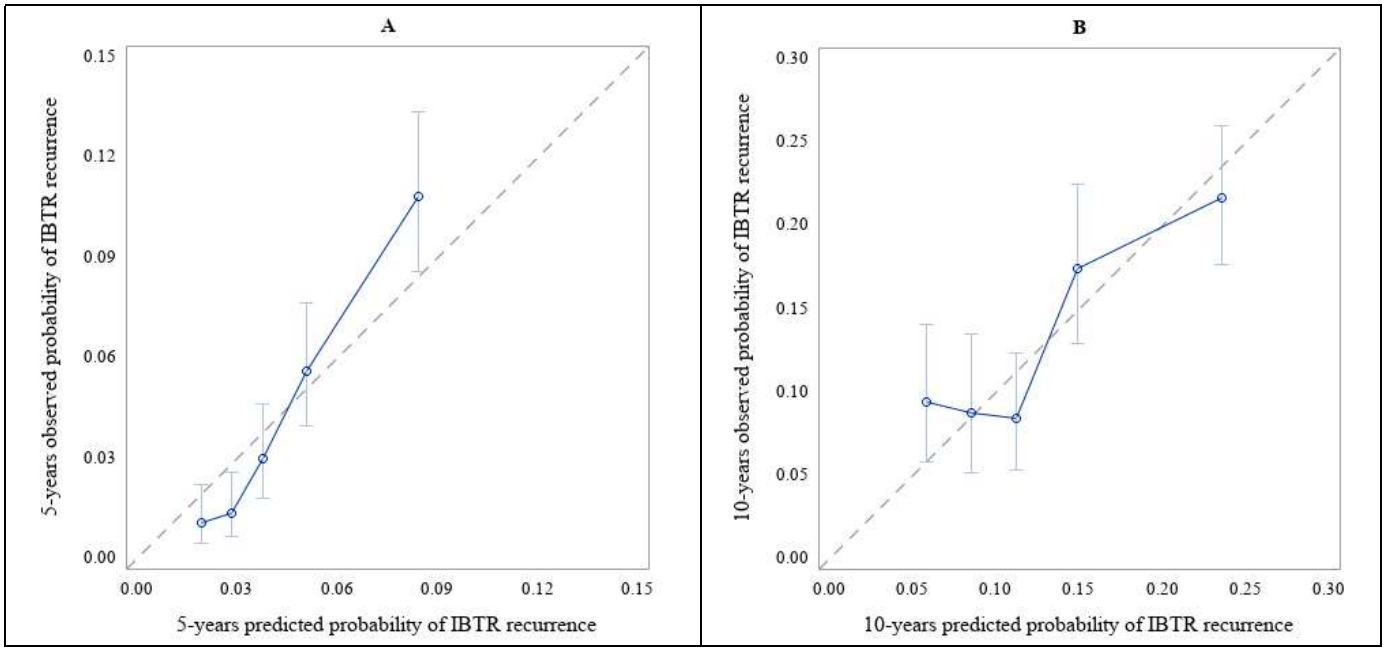


Figure 2. Calibration plots: predicted vs. observed 5-years (Panel A) and 10-years (Panel B) probability of IBTR (internal validation)



Harrell's c-index: 0.69 (95% CI: 0.66 - 0.73)